

Listing of Claims

Claim 1 (original) A method of calculating a modification of a geometrical shape, comprising the steps of:

- defining on a multi-dimensional space an array of values representing a geometrical shape;
- selecting a modification function that represents a desired modification to be applied to the geometrical shape;
- applying an inverse function of the modification function to the array of values to produce a modified array; and
- deducing from the modified array a modification of the geometrical shape that would result from a direct application of the modification function to the array.

Claim 2 (original) The method of claim 1, further comprising the step of applying the deduced modification to the array.

Claim 3 (original) The method of claim 1, further comprising displaying to a user the modification of the geometrical shape that would result from a direct application of the modification function to the array.

Claim 4 (original) The method of claim 1, wherein the step of deducing from the modified array a modification further comprises the steps of:

- retrieving an array value from the modified array; and
- applying the array value from the modified array at a location in the array representing the geometrical shape.

Claim 5 (original) The method of claim 1, wherein the modification function comprises a soft-edged deformation.

Claim 6 (original) The method of claim 1, wherein the modification function is applied from a selected one of a first side and a second side of the geometrical shape.

Claim 7 (original) The method of claim 1, further comprising applying the modification function by manipulation of a virtual tool.

Claim 8 (original) The method of claim 7, wherein the geometrical shape is displaced away from the virtual tool.

Claim 9 (original) The method of claim 7, wherein the geometrical shape is displaced toward the virtual tool.

Claim 10 (original) The method of claim 9, wherein the modification of the geometrical shape is substantially a convex hump.

Claim 11 (original) The method of claim 9, wherein the modification of the geometrical shape is substantially a concave spiked protuberance.

Claim 12 (original) The method of claim 1, wherein the modification function comprises a force field consistent with a tool of arbitrary shape.

Claim 13 (original) The method of claim 1, wherein the modification function comprises translational displacement.

Claim 14 (original) The method of claim 1, wherein the modification function comprises rotational displacement.

Claim 15 (original) The method of claim 1, wherein the modification function comprises a selected one of a displacement function, a smoothing function, a warping function, a volumetric interference, an areal interference, a result of a simulation, a data re-fitting, and a force.

Claim 16 (original) The method of claim 1, wherein the modification function is represented as a non-linear mathematical function.

Claim 17 (original) The method of claim 1, further comprising the steps of:

- selecting a second modification function;
- applying an inverse function of the second modification function to the modified array to produce a twice-modified array; and
- deducing from the twice-modified array a modification of the geometrical shape that would result from an application of the modification function to the array followed by an application of the second modification function to the once-modified array.

Claim 18 (original) The method of claim 1, wherein the modification comprises applying a constraint so as to control a magnitude of a change of the geometrical shape.

Claim 19 (original) The method of claim 18, wherein applying the constraint prevents at least one point of the geometrical shape from moving in response to the application of the inverse function of the modification function.

Claim 20 (original) The method of claim 1, wherein the modification comprises applying a surface texture to the geometrical shape.

Claim 21 (original) A system for calculating a modification of a geometrical shape, comprising:

- a generation module that defines on a multi-dimensional space an array of values representing a geometrical shape;
- a selection module that provides a modification function representing a desired modification to be applied to the geometrical shape;
- a transformation module that applies an inverse function of the modification function to the array of values to produce a modified array; and
- a calculation module that deduces from the modified array a modification of the geometrical shape that would result from a direct application of the modification function to the array.

Claim 22 (original) The system of claim 21, further comprising a modification module that applies the deduced modification to the array.

Claim 23 (original) The system of claim 21, further comprising a display module that displays to a user the modification of the geometrical shape that would result from a direct application of the modification function to the array.

Claim 24 (original) The system of claim 21, wherein the calculation module further comprises:
a module that retrieves an array value from the modified array; and
a module that applies the array value from the modified array at a location in the array representing the geometrical shape.

Claim 25 (original) The system of claim 21, wherein the modification function comprises a soft-edged deformation.

Claim 26 (original) The system of claim 21, wherein the modification function is applied from a selected one of a first side and a second side of the geometrical shape.

Claim 27 (original) The system of claim 21, further comprising a module that applies the modification function by manipulation of a virtual tool.

Claim 28 (original) The system of claim 27, wherein manipulation of a virtual tool displaces the geometrical shape away from the virtual tool.

Claim 29 (original) The system of claim 27, wherein manipulation of a virtual tool displaces the geometrical shape toward the virtual tool.

Claim 30 (original) The system of claim 29, wherein the modification of the geometrical shape is substantially a convex hump.

Claim 31 (original) The system of claim 29, wherein the modification of the geometrical shape is substantially a concave spiked protuberance.

Claim 32 (original) The system of claim 21, wherein the modification function comprises a force field consistent with a tool of arbitrary shape.

Claim 33 (original) The system of claim 21, wherein the modification function comprises translational displacement.

Claim 34 (original) The system of claim 21, wherein the modification function comprises rotational displacement.

Claim 35 (original) The system of claim 21, wherein the modification function comprises a selected one of a displacement function, a smoothing function, a warping function, a volumetric interference, an areal interference, a result of a simulation, a data re-fitting, and a force.

Claim 36 (original) The system of claim 21, wherein the modification function is represented as a non-linear mathematical function.

Claim 37 (original) The system of claim 21, further comprising:

- a selection module that selects a second modification function;
- a transformation module that applies an inverse function of the second modification function to the modified array to produce a twice-modified array; and
- a calculation module that deduces from the twice-modified array a modification of the geometrical shape that would result from an application of the modification function to the array followed by an application of the second modification function to the once-modified array.

Claim 38 (original) The system of claim 21, wherein the modification comprises applying a constraint so as to control a magnitude of a change of the geometrical shape.

Claim 39 (original) The system of claim 38, wherein the module that applies the constraint prevents at least one point of the geometrical shape from moving in response to the application of the inverse function of the modification function.

Claim 40 (original) The system of claim 21, wherein the modification comprises applying a surface texture to the geometrical shape.